

INVENTORYING CONNECTICUT'S VASCULAR PLANT DIVERSITY

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ABSTRACT

The Connecticut Geological and Natural History Survey has been sponsoring botanical inventories in Connecticut since its inception in 1903. In 1975 a field team was charged with beginning a statewide inventory of Connecticut's rare species of vascular plants and vertebrate animals; results of these inventories were published in 1976. This publication listed 274 vascular plant taxa as endangered, threatened, or otherwise of interest as uncommon plant species. In 1982 the Connecticut Natural Diversity Data Base was established as a program of the Connecticut Geological and Natural History Survey. The charge of the Data Base is both to accumulate and disseminate data on the biota of Connecticut with special attention being paid to Species of Special Concern. The Natural Diversity Data Base currently lists 331 vascular plant taxa.

Since 1979 the Survey has increased its field efforts to locate Species of Special Concern. In addition to a botanist, the Survey funds a full-time plant ecologist whose primary charge is to establish a biophysical land classification for Connecticut. Plant communities are being mapped on 1:250,000 base maps. The Survey also has responsibility for a land owner contact program called the Connecticut Natural Heritage Registry which uses rare species information obtained from the Natural Diversity Data Base.

Recent field work has yielded some interesting botanical finds. A number of historic records have been re-located, including *Cypripedium reginae*, *Petasites frigidus* var. *palmatus*, *Cryptogramma stelleri*, *Polygala senega*, *Polygala nuttallii*, and *Solidago rigidus*. New localities for *Trollius laxus* ssp. *laxus*, *Viburnum prunifolium*, and other species of concern have been found. One locality for a U.S. Endangered Species, *Isotria medeoloides*, is currently known in Connecticut. Some species new to Connecticut such as *Psilocarya scirpoides* have been located.

Research on *Moehringia macrophylla*, a species which occurs in Connecticut at two algific talus slopes, is briefly discussed as an example of new program directions.

HISTORY OF STATE EFFORT

The Connecticut Geological and Natural History Survey vascular plant inventory began in 1903. On June 3 of that year, the state legislature established the State Geological and Natural History Survey, and charged it with inventorying and researching the geology and biota of the state. It had a board of commissioners and a paid, part-time superintendent, William North Rice of Wesleyan University. A few months earlier, in January, 1903, a group of interested gentlemen had formed the Connecticut Botanical Society (Eames, 1903). Shortly after the establishment of

the Survey, Rice approached the state flora committee of the Botanical Society actively working on a state catalog. This committee responded "most cordially to the suggestion that they find in the newly organized State Survey, a medium for the publication of the results of their labor" (Rice, 1904).

It was not until 1974 that the Survey hired its first full-time biologist, Joseph Dowhan. He was charged with identifying the rare flora and fauna of Connecticut and their habitats. Dowhan, together with his field team of R. J. Craig and L. J. Mehrhoff, spent the next two years in this preliminary study. The results of this initial effort were published by the State Survey in 1976 as a Report of Investigations entitled, *Rare and Endangered Species of Connecticut and Their Habitats* (Dowhan and Craig, 1976).

In 1978, Dowhan left the Connecticut Geological and Natural History Survey and I replaced him as the head of the Survey's biology program. At that point the primary interest shifted to botanical field work. We also hired a second biologist, a plant ecologist, Kenneth J. Metzler, to assist in the inventory.

The *Rare and Endangered Vascular Plants of Connecticut* was published in 1978 in conjunction with the New England Botanical Club's Rare and Endangered Species committee, with financial support of the U.S. Fish and Wildlife Service (Mehrhoff, 1980).

In 1982, the Survey entered into a memorandum of understanding with the Connecticut Chapter of The Nature Conservancy to form the Connecticut Natural Diversity Data Base. The Data Base employed the Conservancy's Heritage Program methodology to manage data in a computer-assisted topographic mapping program. This kind of data base is used for storing and retrieving data so they can be used for land use decision making needs (Jenkins, 1978, 1981). This data base gave us a mechanism for making our data available to the public. Nancy M. Murray was hired to manage these data and to handle requests for information. Currently, we have over 2500 occurrences of both Species of Special Concern and natural communities on our maps.

We have gone one step further with our natural communities. Each community type is mapped on separate 1:250,000 scale maps, giving us the capability to scan the state quickly to see distribution of a particular habitat type. This capability is especially helpful when looking for rare plants which have specific habitat requirements. Using a system of open and closed circles

allows us to tell at a glance whether or not we have any information on a particular site.

The Connecticut Geological and Natural History Survey currently maintains a list of 331 vascular plant taxa that we consider Species of Special Concern. Additional taxa are being considered for inclusion, other species are being reviewed for possible deletion.

Embarrassingly, Connecticut currently has no endangered species legislation. (There is strong reason to believe that this void might be filled after the next legislative session in Connecticut.) The embarrassment is exacerbated by the fact that Connecticut was probably the first state to pass legislation to protect a plant species of aesthetic nature (Eaton, 1879; Mehrhoff, 1980).

Connecticut, for a small state of 5009 square miles, exhibits remarkable diversity. Over the past 15 years we have been fortunate in identifying critical localities for many of our less common taxa. We are also fortunate in having partners in preservation such as the Connecticut Chapter of The Nature Conservancy who assist when we do locate a stand of a rare species. Again, in conjunction with The Nature Conservancy, we have established a landowner contact program called the Natural Heritage Registry Program. At present, work is under way to assure the long-term survival of many of our rare vascular plants.

SPECIFIC TAXA DISCUSSIONS

We have been told elsewhere in this symposium by Dr. Hugh Iltis that true endemics should not exist in glaciated areas. Luckily, Gregory J. Anderson anticipated Iltis's comments and reduced Connecticut's only endemic species, Graves Beach Plum (*Prunus gravesii*), to a variety of the common Beach Plum (*Prunus maritima*). There are numerous data to support this position. *P. maritima* var. *gravesii* quite possibly might have arisen as a mutation which would explain this single population (Anderson, 1980).

The only U.S. Endangered Species of vascular plant currently known to exist in Connecticut is *Isotria medeoloides*. Until recent field work in New Hampshire and Maine yielded such good results, Connecticut had the highest number of historic localities. Prior to 1970, *Isotria medeoloides* had been reported from seven

localities in the state. We have not been able to locate any of these stations. Our one current population was discovered after a newspaper article with an illustration ran in the Sunday edition of the *Hartford Courant*. Someone who had seen the plants in northwestern Connecticut a year earlier reported the locality to us. When we first visited the site in 1984, we found four plants and a squared-off hole where a fifth plant had been removed. In 1986, we could not find any plants at this site, but in 1987 we found another subpopulation of nine plants five meters from the location of the original site. Seven individuals were observed in 1988.

This hole where a plant of *Isotria medeoloides* had been removed is what prompted the Connecticut Geological and Natural History Survey to seek legislation making information in the Natural Diversity Data Base exempt from the Connecticut Freedom of Information Act. Section 24-2a of the General Statutes helps us protect our information by giving us the right to deny the request for Natural Diversity Data Base information unless good reason for its need is presented. To date, we have not had to use this capability.

In contrast, Connecticut has a number of sites for *Isotria verticillata*. Many of these localities are in eastern Connecticut; a few of the sites may have as many as 1,000 individuals.

The rest of Connecticut's Species of Special Concern may be more common elsewhere; an example is the three-toothed Cinquefoil, *Potentilla tridentata*. Although common in northern New England, Connecticut has only three stations, all found in the northwest uplands. There is a fourth locality along the Connecticut coast, but I question its naturalness at this site. It is in New Haven County, near Long Island Sound. The colony is healthy and appears to be spreading. This area was well botanized in the early part of the 20th century; no mention was ever made of *Potentilla tridentata* at this locality. The fact that it may not be native can perhaps be corroborated, because it does not occur along the Rhode Island coast (R. Enser, pers. comm.), and in Massachusetts it occurs as far south as Cape Cod, in sand (B. Sorrie, pers. comm.). If it is native at this site it would mean that the coastal Connecticut population constitutes a major disjunction. This interpretation is hard to accept especially since Long Island Sound's currents flow predominantly toward the open sea to its east.

The calcium carbonate region of western Connecticut has yield-

ed many interesting plants which, although possibly more abundant elsewhere, are rare in Connecticut. One of these plants is *Trollius laxus* ssp. *laxus*. There are currently five populations of this species in Connecticut, all in Litchfield County. Although we had looked for this taxon for a number of years, it was first re-located by us in May, 1979. Since then, we have located an additional four stations; at two of these sites, it is locally abundant. It appears that individuals do not flower every year.

Petasites frigidus var. *palmatus* is another calciphile found in the wetlands of Litchfield County's limestone region. Although historic records existed, this plant was not re-located until 1981. We currently know of five stations.

Another calcareous wetland species that has recently been re-located in northwest Connecticut is *Cypripedium reginae*, first re-located by Caren Caljouw in 1982 while working as a Natura Conservancy intern. Caren convinced the Connecticut Chapter that in order to best understand their limestone fen preserves in this region she had to look at as many calcareous wetlands as possible. I think Caren doubled our knowledge of the current calcareous wetland flora that summer. *Cypripedium reginae* was thought to have been extirpated from northwest Connecticut by wildflower gardeners. We currently have three stations for this species; only one of these sites is protected at present.

Rhynchospora capillacea was first found in Connecticut in 1910 and had not been collected again until 1982. In Connecticut this northern calciphile is now known from two disturbed localities. The clue to locating additional stands may be to look in disturbed wetlands with exposed calcareous soils.

Selaginella eclipses, a midwestern species, was first discovered to exist in northwestern Connecticut by Dr. Terry Webster from the University of Connecticut. This taxon closely resembles *S. apoda* and he noticed a misidentified specimen in the University of Connecticut Herbarium (CONN). We began to search suitable habitats in Connecticut's limestone region and found three localities for *Selaginella eclipses*, but we were not able to re-locate the original population in Ridgefield. The best stand of this taxon was found in 1982 on the damp floor of a then abandoned limestone quarry. That site has since been destroyed by reactivation of the quarry. There are taxonomic questions about the validity of this species which need to be addressed.

Until recently, *Polygala senega* was only known from one his-

toric locality in Connecticut, where it was last collected in 1933. With a search image gained on the Spring 1987 New England Botanical Club Field Trip to Burlington, Vermont, we were able to go to the old locality in Litchfield County and relocate the Connecticut population. There are over 500 plants on a dry limestone ridge. Other species of note at this site are *Quercus muhlenbergii*, *Linum sulcatum*, *Asclepias verticillata*, *Onosmodium virginianum*, *Liatris borealis*, and *Solidago rigidus*. *Taneidia integerrima* was also reported from this locality in 1900 but has not been relocated.

Rare pteridophytes are well represented in the marble regions of western Connecticut. *Asplenium ruta-muraria* is currently known from five localities. *Cryptogramma stelleri* eluded us until recently when we re-located a small population near a limestone seep.

A habitat which is well represented in Connecticut is *Sphagnum* bogs. Many of these bogs are actually quite different from one another and the species composition of many of them is also very different. A number of Species of Special Concern are found in the State's sphagnous bogs or acidic fens. Interestingly, many of the bogs support different assemblages of rare species than ones nearby. *Andromeda glaucophylla* is known from six localities in the state as is *Eriophorum spissum*. *Ledum groenlandicum* occurs at four sites. Historically *Scheuchzeria palustris* occurred in at least six localities; currently it is only known from one sphagnous bog in Connecticut. All these bogs occur in the northern half of the state.

A bog species that has an interesting distribution in southern New England is dwarf mistletoe, *Arceuthobium pusillum*. In Connecticut it is extant at two localities in one town. It had also been collected at two other bogs in nearby towns in the northwest corner; it has not been collected elsewhere in Connecticut. Interestingly, it occurs in Rhode Island less than a mile from Connecticut's eastern border.

The Hartford Fern or Climbing Fern, *Lygodium palmatum*, was apparently abundant in the central valley and in the ecologically similar sites in the southeastern uplands. We have at least 31 historic localities for *L. palmatum* in Connecticut. This species had suffered from both habitat destruction and over-collection. Collection pressure in Connecticut was so heavy the 1869 Law was passed (Eaton, 1879). Now the rapid urbanization of Con-

necticut's central valley precludes the possibility of many additional localities being found. The extensive stands in the state occur in Windham County. There are eight extant populations currently known from Connecticut; only three appear to be flourishing.

Rhododendron maximum can be found in a variety of habitats in Connecticut. It currently occurs on three wooded rocky slopes in Litchfield County. It has been reported from one swamp each in Fairfield, Windham, and Tolland Counties; in New London County it occurs in a few wetlands, usually as an understory dominant in stands of Atlantic White Cedar (*Chamaecyparis thyoides*). It has not been reported from Hartford, New Haven, and Middlesex Counties.

Minuartia glabra (= *Arenaria groenlandica* var. *glabra* (Fernald, 1950)) has an interesting distribution. It occurs both on the coast and inland in Maine, on a few mountain tops in north central New Hampshire, and has not been reported from Vermont and Massachusetts. In Rhode Island it occurs on a few rock outcrops in Washington County. It also occurs to the west of Connecticut in the Schwangunk Mountains and Catskill region of New York (Fernald, 1917; Seymour, 1982). In Connecticut, it occurs on pegmatite outcrops in Middlesex County (Harger et al., 1930). It occurs predictably on many pegmatite outcrops in this region.

Liquidambar styraciflua reaches the northern limit of its range in southwestern Fairfield County. We know of five sites where we feel reasonably confident that it is native. We have recently noticed that another Connecticut rarity, *Viburnum prunifolium*, occurs as an associate with *Liquidambar*. Currently, we know of four stations for this species in southwestern Connecticut.

Both *Liquidambar styraciflua* and *Viburnum prunifolium* are species which commonly occur in New Jersey's piedmont region. It is interesting to speculate as to the possibility of a northern extension of the piedmont into Southern New England. No hard data exist to support this hypothesis at present.

Another southern taxon reaching the northern limits of its distribution in Connecticut is *Floerkea proserpinacoides*. We have two extant localities, both on alluvial floodplains in southwestern Connecticut. This species is so ephemeral that it is conceivable that more populations exist. Historically, it occurred at six localities in Connecticut.

The persimmon, *Diospyros virginiana*, is another southern tax-

on which occurs along Long Island Sound. There have always been questions about the nativeness of *Diospyros* at its one Connecticut site near New Haven. Graves et al. (1910) in *Catalogue of the Flowering Plants and Ferns of Connecticut* state, "This station is said to have been known as early as 1846." They go on to question whether or not it might have been introduced by man. If it is native, it represents the northeastern limit of its distribution (the populations on Cape Cod are known to have been introduced after a shipwreck (P. Rich, pers. comm.; B. Sorrie, pers. comm.)). It also occurs at scattered localities, where it is thought to be native, around Long Island Sound in New York (J. Beitel, pers. comm.). From a preservationist point of view its nativeness in Connecticut is now a moot point. This once abundant species (1899 photographs, Connecticut Geological and Natural History Survey archives) has dwindled to a single staminate individual. As a dioecious species this taxon has been functionally extirpated from Connecticut.

Another southern element which occurs in Connecticut on the traprock (basalt) ridge system which bisects the state is *Corydalis flavula*. This species was historically known from three localities but had eluded us until 1981 when Bruce Tiffney and NEBC members re-located one of the populations. Learning the habitat for this species was important in re-locating the other two stations, which we did in 1983. *Corydalis flavula* is a spring ephemeral and most easily found when in flower at the end of April or early May.

Muhlenbergia capillaris is currently known from only one locality in southern Connecticut. It occurs here on exposed traprock ledges. Historically, there were four Connecticut stations. *Sporobolus heterolepis* also occurs at some of these sites.

Another southern species, disjunct in New England at one locality is the Hairy Lip Fern, *Cheilanthes lanosa*. It occurs on a shaded traprock ledge in southcentral Connecticut. *Cheilanthes* was originally found on West Rock, New Haven, Connecticut in 1892. Although it was not recognized as *Cheilanthes*, the specimen was taken to Daniel Cady Eaton at Yale who identified it as *Cheilanthes* and forwarded it for verification to William Davenport, another fern specialist with the Massachusetts Horticultural Society. We know from Eaton's correspondence where this plant had been found. The site was quarried some time in the early 20th century and the station destroyed. Our current station

was located in 1978 by B. G. Aiken (Aiken, 1980). This site was the first site to be registered with the State and The Nature Conservancy's Natural Heritage Registry.

Another interesting rarity of the basalt ridge system is the Prickly Pear Cactus, *Opuntia compressa*. One station is known from an open ledge on one of the southern traprock ridge tops. This species also occurs naturally along our coastline. *Opuntia* can be found at seven other coastal sites on sandy beaches or rocky headlands.

The coastal plain element of Connecticut's flora is well represented in spite of the fact that we have no coastal plain in Connecticut. Geomorphologically, Glacial Lake Connecticut separated the coastal plain on what is now Long Island from mainland Connecticut. We do have a number of ecologically similar habitats, however. Most of these occur in sandy deposits that formed as postglacial lake beds such as were formed by Glacial Lake Hitchcock. We look in these areas for our rare coastal plain taxa.

Lachnanthes caroliana presently occurs at only one locality. *Saururus cernuus* can be found at two stations. *Polygala nuttallii* occurs at one ecologically similar locality on a dry ridge in the central portion of our state. *Rhynchospora macrostachya* occurs at five localities. The diminutive *Hemicarpha micrantha*, although reported from six localities, can only be found on one pond shore where it was first discovered in 1984. Interestingly, although historic specimens average 2–6 cm in diameter, our extant plants are not much bigger than a dime. *Scleria reticularis* can be found at one station where it was first located in 1907.

Psilocarya scirpoides was located in 1983 along a pond shore in the northcentral valley of Connecticut (Mehrhoff, 1982). The water level at this pond draws down by the end of the summer, similar to the ponds of Cape Cod and southern Rhode Island. *Psilocarya* occurs along the exposed margins. In years of highwater (1984–85), we could not find this species; it was last seen at this site in 1987.

Perhaps the most striking coastal plain species in Connecticut is *Platanthera ciliaris*, the Yellow-fringed Orchid. Its only extant New England stations are in southern Connecticut, where we have six current sites. One of these, however, is unique. This station has been estimated to have over 5000 individual plants in a two-acre area. This appears to be the largest population of *Platanthera ciliaris* known. Current studies are underway to learn more about

this species' ecology. The site although vulnerable to adjacent agricultural land use is currently registered with the Natural Heritage Registry. The owner has managed this site for the enhancement of the orchid by mowing the area after the *Platanthera* has finished fruiting. This has kept the woody vegetation under control and possibly helped to disperse the seeds.

Arethusa bulbosa was once widespread in Connecticut. In 1982, we found two of our historic populations but one of these has not been seen since 1983.

Several rare species have been located along the Connecticut River. *Orontium aquaticum* can be found in a number of freshwater tidal marshes along the lower portion of the river; it also occurs in a few localities away from the Connecticut River. *Arisaema dracontium* can also be found in many of the remaining remnants of once-extensive flood plain forest. Like *Orontium*, it occurs in a few localities away from the Connecticut River, along the Housatonic and Pomperaug Rivers.

Populus heterophylla has been reported from three sites along the Connecticut River. Currently we know of its occurrence at only one of these sites. Two other stations are known, one in a swamp in south central Connecticut where only a few individuals still persist, and from one station surrounding a vernal pool near the summit of a traprock ridge, where it appears to be flourishing. It was first reported here in 1911 (Harger, 1913). *Salix exigua* (= *Salix interior* (Fernald, 1950)) the sandbar willow, is currently known from three localities along the Connecticut River. I fully suspect that it occurs in more localities but we must walk the available river shoreline in order to locate additional stations.

Honkeyneya peploides (= *Arenaria peploides* (Fernald, 1950)), common further north, occurs along the eastern portion of Connecticut's coastline. It does not occur west of Westbrook. One station for *Ranunculus cymbalaria* has been located at the edge of a saltmarsh in southeastern Connecticut. A southern grass, *Panicum amarum*, can be found at six localities in western Connecticut, although it has been reported as far east as East Lyme. Likewise, *Aristida tuberculosa* can now only be found along the Connecticut coastline in Fairfield County.

FUTURE DIRECTION

As was stated earlier, Connecticut does not presently have the statutory authority to protect its rare flora or fauna. A bill is

currently being drafted that will correct this deficiency. Such legislative authority is of paramount importance to our efforts.

Inventory is still the primary function of the Connecticut Geological and Natural History Survey's Biology Program. In addition to cataloguing the flora and plant communities of the state, some research on rare plants is being conducted.

Moehringia macrophylla (= *Arenaria macrophylla* (Fernald, 1950)) occurs at two algific (ice-filled) talus slopes in southern Connecticut. Other sites in the northeast where this species occurs are on serpentine rocks. In Connecticut it occurs at the base of basalt ledges and talus slopes. The crucial difference is that ice forms in these slopes and persists well into the summer. I have found ice at one of the sites as late as the first of August. In addition, a number of taxa more typically found in northwestern Connecticut occur here as well. Temperature data (Mehrhoff, in press) indicate that the area at the base of these slopes remains much colder than the surrounding areas. This species is dispersed by ants (van der Pijl, 1982). Edward O. Wilson, of Harvard University, has suggested that I may find, with the *Moehringia*, species of ants not commonly found in southern New England. To date I have only observed two individuals, each of a different species (one *Camponotus pennsylvanicus*, one not identified). Both sites are currently registered with the Natural Heritage Registry.

Dan Janzen has said that interactions between species and between species and their environment are the most important goals of protection (Janzen, 1988). By inventorying the flora and doing research of this nature we are trying to protect these interactions. Because we don't recognize many of the interactions at present, we can only strive to protect species' critical habitat. In a state facing the development pressures that Connecticut is currently facing, this will be no easy task. We are lucky to have the support of organizations like The Nature Conservancy, and of the many people in the state who believe in the preservation of Connecticut's Natural Heritage.

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